MS DEQ Nutrient Task Force

COASTAL AND ESTUARINE SUBCOMMITTEE

Group of scientific experts with diverse backgrounds, charged with:

- development of nutrient criteria for coastal and estuarine waters of Mississippi
- assessment of nutrient data that are available in the WADES database, and other sources, that can be used in criteria development
- development of a sampling and monitoring plan
- selection of parameters that should be sampled
- assessment with the consideration of links of nutrient data to biological effects

NTF Coastal and Estuarine Subcommittee Participants and Affiliations

- Peter Shuba, Strategic Planning Services
- Larinda Tervelt, EPA / Gulf of Mexico Program
- Harriet Perry, GCRL, Center for Fisheries Research & Development
- Barbara Viskup, MDEQ, Southern Regional Office, logistics and field support
- Kevin Pigott, MDEQ, Environmental Scientist
- Melanie Magee, EPA / Gulf of Mexico Program
- Chet Rackocinski, GCRL, ecology, benthos and eutrophication
- David Burke, GCRL, zoologist, logistic support
- Marius Brouwer, GCRL, biochemist/molecular ecologist
- Leslie Barkley, MDEQ, Environmental Engineer
- Ray Montgomery, MDEQ consultant (nutrient criteria development)
- Don Redalje, USM-SSC, Department of Marine Science

Subcommittee Goals

- Review of existing nutrient data available for the water bodies
- Assessment of additional data needs for nutrient criteria development
- Selection of parameters for sampling in the proposed plan
- Selection of sampling and analytical methods to be used in the plan
- Identification of potential links of nutrient data to biological effects in the water bodies

MSDEQ WADES Database:

Nutrient Information Summary

Pascagoula River

- 112 sampling events
- Winter, spring summer and fall sample collections
- Parameters were TKN, N+N, TN, TP, and turbidity
- Majority of the samples collected from 1997 -2000

Escatawpa River

- 75 sampling events

East Mississippi Sound

- 207 sampling events

Nutrient Criteria Development
Sampling and Monitoring Plan

National Coastal Assessment Program

- probabilistic study design, sampling once per year (July - Sept); uniform set of parameters and standard protocols
- water quality indicators used in the NCA Program are:
  - dissolved oxygen
  - salinity
  - pH
  - temperature
  - Secchi depth
  - light attenuation
  - dissolved nutrients
  - total suspended solids
  - chlorophyll a

MS DEQ Nutrient Task Force
Coastal and Estuarine Subcommittee Recommendations

- Causal variables
  - TP, TKN, TN, NH_3, NH_4, NO_3+NO_2
  - dissolved and total nutrients
  - TSS, TVS, TOC, DOC, particulate carbon
  - BOD, COD
  - total silicates
  - DO (instantaneous and diurnal)
- Response variables
  - chlorophyll a
  - water clarity
- Sampling/analytical methods to follow NCA guidelines

Targeted Sampling Stations

- Drivers for selecting the stations:
  - total nitrogen greater than 1.0 mg/l
  - total phosphorus greater than 0.3-0.4 mg/l
  - nutrient spikes
  - lack of data

Gulf of Mexico Estuarine Inventory Data

- GMEI conducted at 51 stations in coastal waters of five states that border the Gulf of Mexico during May 1968 through April 1969
- Center for Fisheries Research and Development used the same sampling and analytical methods to collect and analyze samples from 36 of the locations during May 2001 through April 2000
- parameters include surface and bottom water temperature, salinity, dissolved oxygen, pH, total nitrite, total nitrate, orthophosphate, and total phosphate
- data analysis suggests that nutrient data taken at widely different sampling intervals can be compared

Sampling and Monitoring Plan

Parameters to be sampled:

- Dissolved Oxygen, including diurnal events
- pH
- Temperature
- Salinity
- Turbidity
- Total Dissolved Solids
- Ammonia Nitrogen
- Nitrite plus Nitrate Nitrogen
- Total Kjeldahl Nitrogen
- Total Phosphate
- Chlorophyll a
- Benthic Macrofauna

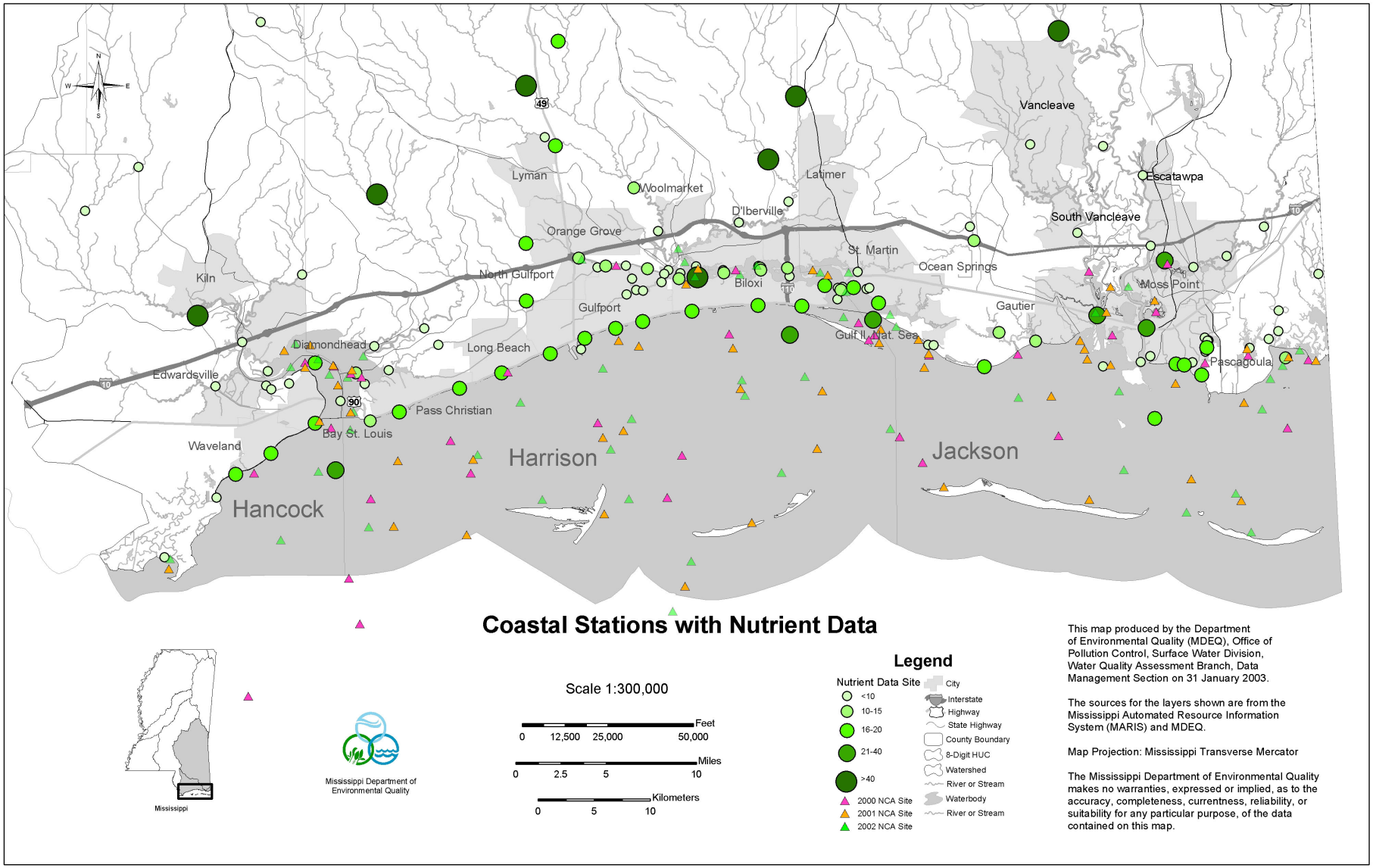
Sampling and Monitoring Plan (concluded)

- Sampling Intervals
  - Quarterly
    - proposed start date of March or April 2003
- Sampling and analytical methods
  - US EPA NCA Program Guidance
- Draft Scope of Work
- Identification of links between nutrient data and biological effects

Definition of Hydrodynamic Regions:
Mississippi Sound and Adjacent Waters

- We have a suite of data for nearshore and coastal estuarine locations, coastal streams, and stations within Mississippi Sound

- **How do we make the best possible use of this information?**



Coastal Stations with Nutrient Data

Mississippi

Mississippi Department of Environmental Quality

Scale 1:300,000

Feet
0 12,500 25,000 50,000

Miles
0 2.5 5 10

Kilometers
0 5 10

Legend

Nutrient Data Site
- <10
- 10-15
- 16-20
- 21-40
- >40
- 2000 NCA Site
- 2001 NCA Site
- 2002 NCA Site

- City
- Interstate
- Highway
- State Highway
- County Boundary
- 8-Digit HUC
- Watershed
- River or Stream
- Waterbody
- River or Stream

This map produced by the Department of Environmental Quality (MDEQ), Office of Pollution Control, Surface Water Division, Water Quality Assessment Branch, Data Management Section on 31 January 2003.

The sources for the layers shown are from the Mississippi Automated Resource Information System (MARIS) and MDEQ.

Map Projection: Mississippi Transverse Mercator

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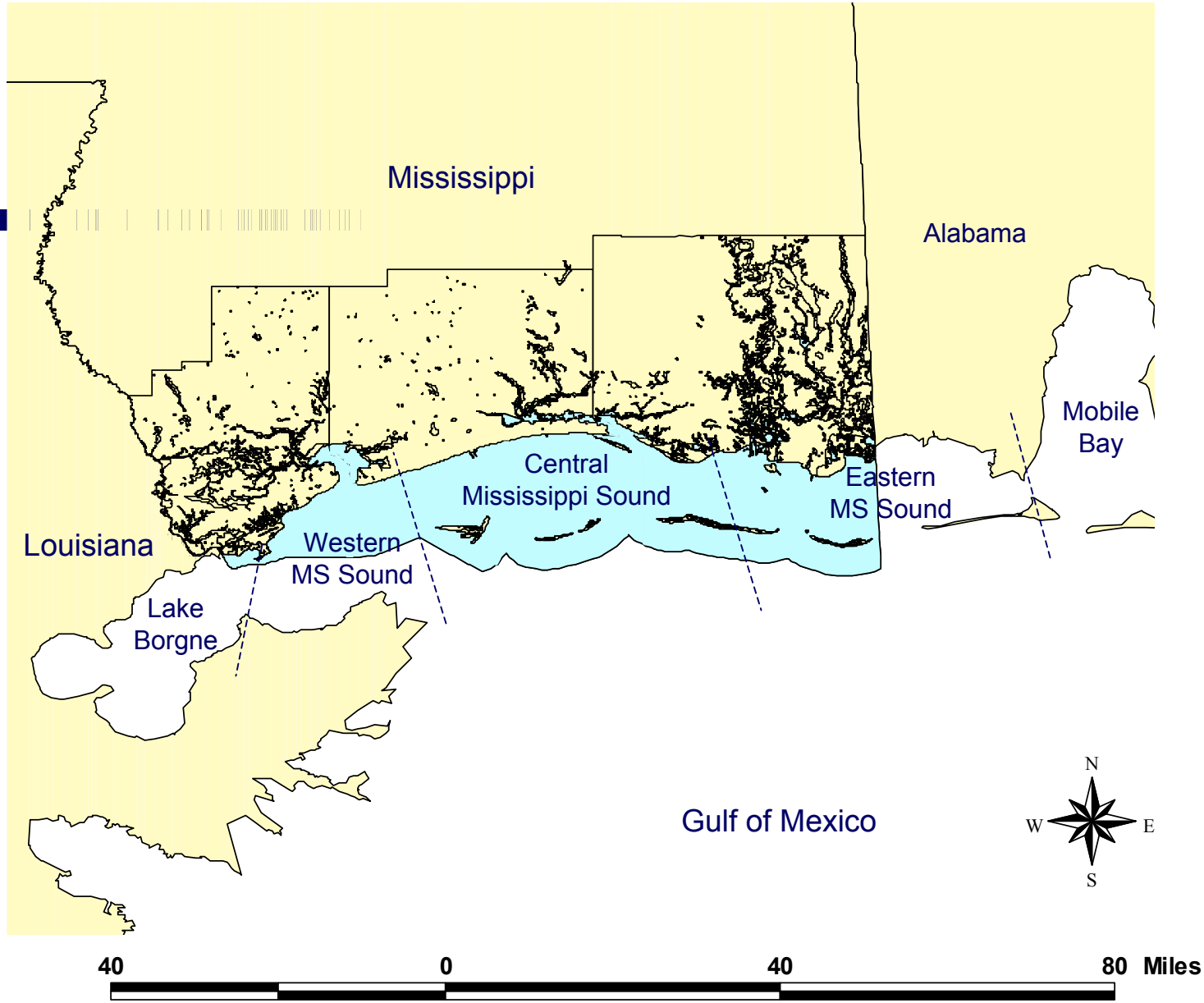
Defining Hydrodynamic Regions

Hydrodynamic regions are best described using a suite of measurable parameters:

(1) wind
(2) freshwater river inflows
(3) water temperature
(4) salinity
(5) bathymetry


Mississippi
Alabama
Mobile
Bay
Central
Mississippi Sound
Eastern
MS Sound
Louisiana
Western
MS Sound
Lake
Borgne
Gulf of Mexico
N
W
E
S
40
0
40
80
Miles

NGLI/ECOM Model Regions

(1) Pearl River
(2) Wolf and Jourdan Rivers
(3) Biloxi Back Bay
(4) Pascagoula River
(5) Eastern MS Sound / Mobile Bay
(6) Mobile Bay
(7) Gulf of Mexico / Mississippi Bight

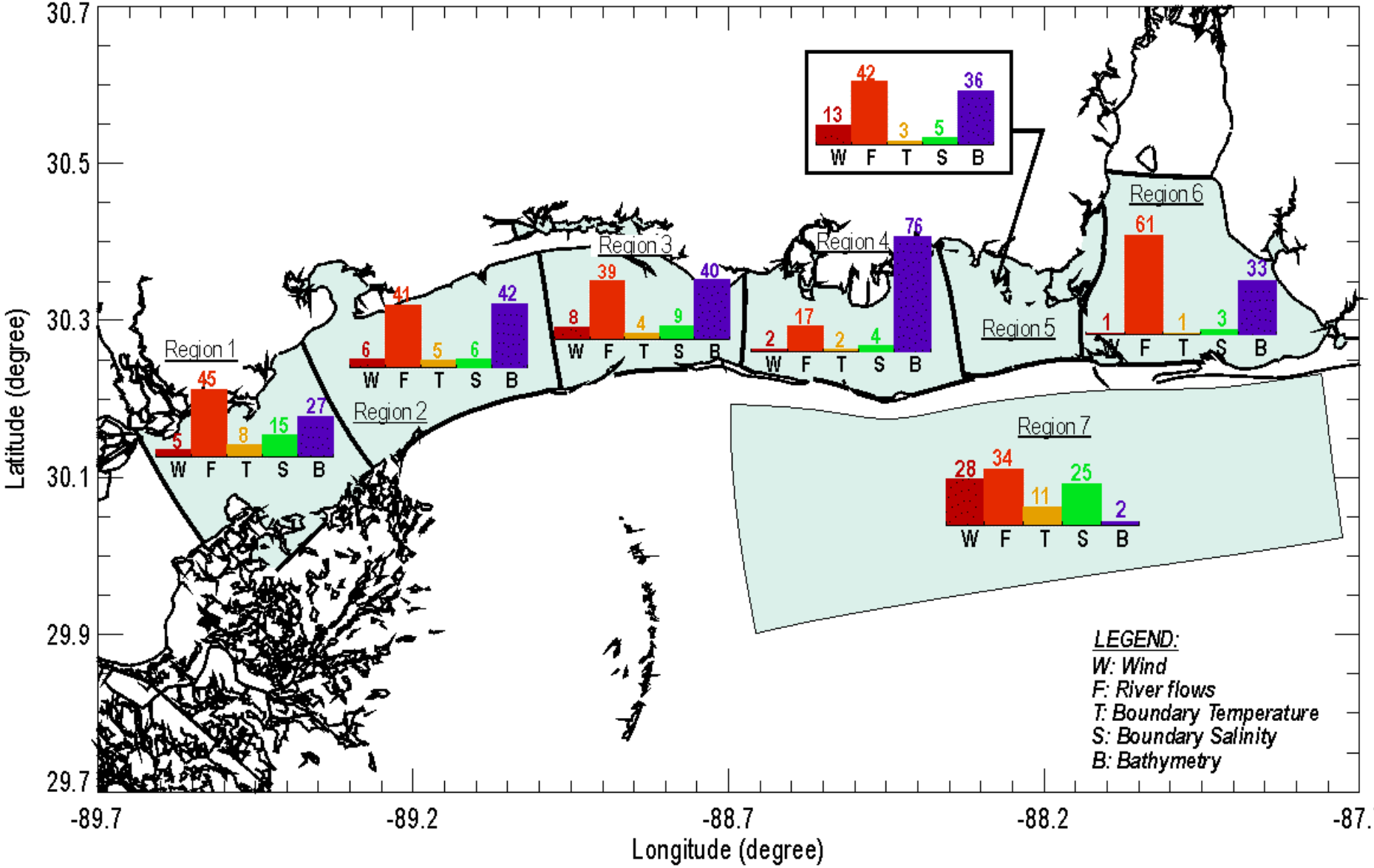
Source: Quamrul Ahsan, Ph.D., P.E., Project Manager, HydroQual, Inc.
NGLI/ECOM Model for Mississippi Sound

Variables affecting surface water quality

On the following maps, bar graphs denote percent variance for each parameter within the legend

Maps are shown for factors affecting surface salinity, water temperature, and current speed

Maps were provided by Quamrul Ahsan, Ph.D., P.E., Project Manager, HydroQual, Inc., based on data for the NGLI/ECOM Model for Mississippi Sound

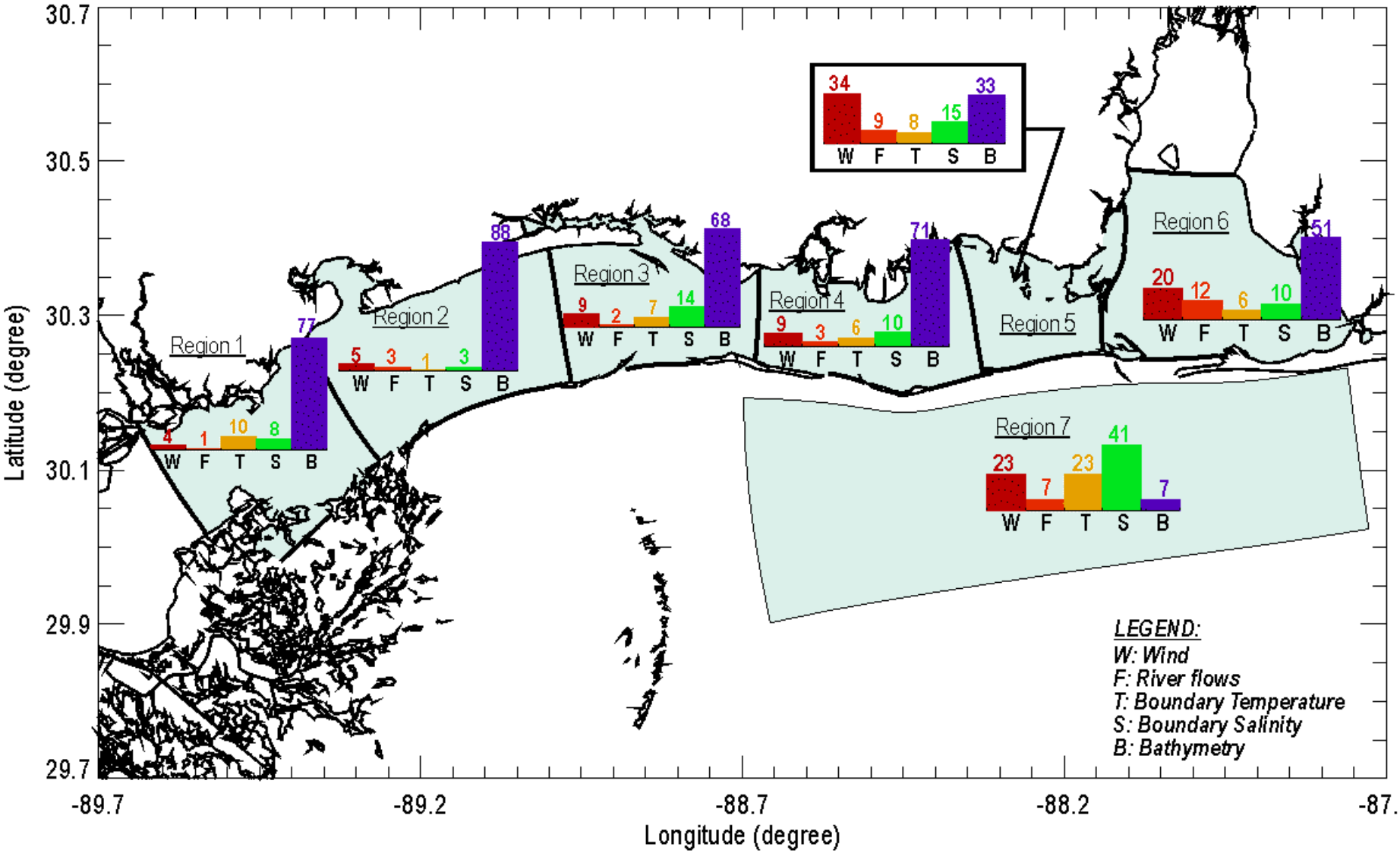


Salinity data

Average Variances in Salinity

River Flows (red bars):
39.8 % of salinity variance

Bathymetry (purple bars):
36.6 % of salinity variance



Temperature data

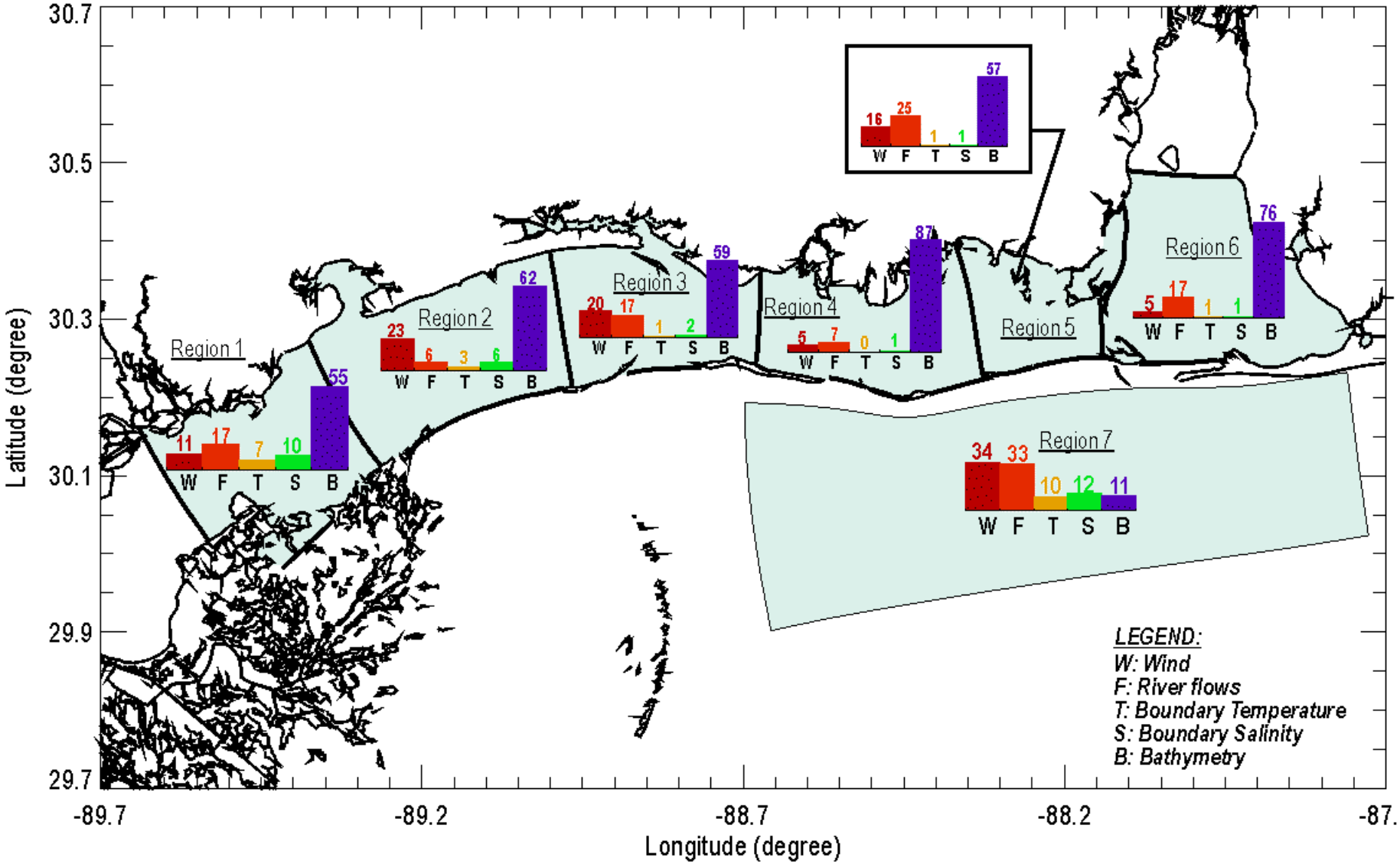
Variances in Water Temperature

Bathymetry (purple bars):
56.4 % of water temperature variance

Wind (maroon bars):
20.0 % of water temperature variance

Salinity (green bars):
14.4 % of water temperature variance

River flows (red bars):
5.3 % of water temperature variance



Current speed data

Average Variances in Current Speed

Bathymetry (purple bars):
58.1 % of water temperature variance

River flows (red bars):
17.4 % of water temperature variance

Wind (maroon bars):
16.1 % of water temperature variance

Predominant forcing functions:

- bathymetry
- fresh water inflows
- winds

Regions of Mississippi Sound

Mississippi Sound regions can be defensibly delineated, according to bathymetry, winds, and freshwater influences, in to the following regions:

Region 1-Pearl River
Region 2-Wolf and Jourdan
Region 3- Back Bay
Region 4-Pascagoula
Region 5-Mobile Bay

… and, the data can be pooled for each region.